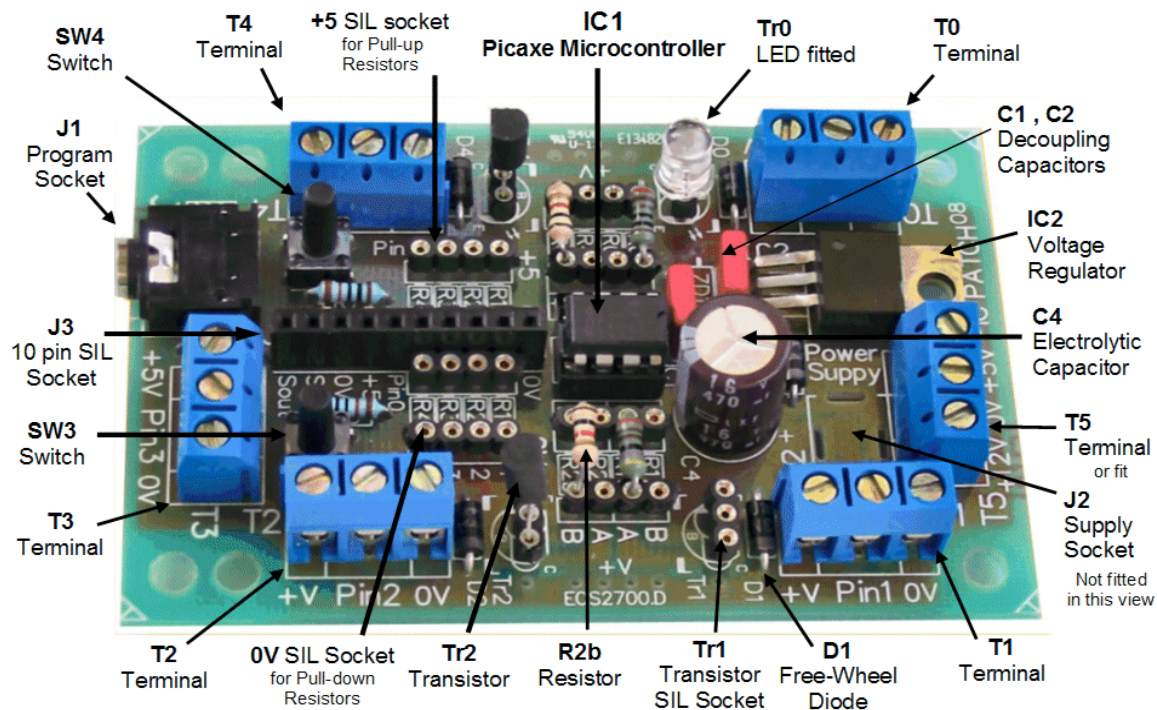


## ASSEMBLY INSTRUCTIONS

### PicPatch™ Pic Microcontroller Application Board

The multipurpose microcontroller interface suitable for education and basic control system applications.

**FIGURE 1. Assembled PicPatch<sup>08</sup>**



### INTRODUCTION

Welcome to the PicPatch<sup>08</sup> microcontroller kit, the fun way to learn basic electronics and software programming. The PicPatch<sup>08</sup> microcontroller kit is a basic control system that you can build and rebuild into many practical applications with possibilities limited only by your imagination. Application examples and education tutorials are available from Websites listed at the end of this document.

Carefully read the entire PicPatch<sup>08</sup> Kit assembly instructions before you commence assembly work.

The components supplied are divided into separate packets, the “Fundamental” packet of components are fitted and soldered directly onto the PicPatch<sup>08</sup> printed circuit board (PCB). The “Elementary” and “Standard” kit packets contain accessory components for different application projects, which include sensors, transducers and discrete components that are inserted into the 4 pin SIL sockets as illustrated in Figure 1.

Have ready the appropriate tools to assemble the PicPatch and see the recommended tool list and materials, (Tables 2 & 3). If this is your first experience at soldering and putting together a electronic kit set we strongly advise before starting that you carefully read the document on “Soldering Techniques”, which is free to download from the KEI Website listed at the end of this document. Practice using a soldering iron and making good solder joints on a Vero board before you begin any assembly work on the PicPatch circuit board.

## GUARATEE

Carefully inspect the kit packets and check that all of the components on the enclosed lists have been supplied. If there are any items missing please inform your supplier and return the kit within seven days.

**Do not assemble the kit otherwise the guarantee will become void.**

## ASSEMBLY

For ease of assembly solder the components onto the PCB in order as listed below from the shortest to the tallest components. Trim the diode and resistor leads after they have been soldered into the Circuit Board.

Use Figure 2 “PicPatch<sup>08</sup> Layout” as a guide to help locate each component on the circuit board.

**Note: Check components for correct orientation as listed. Incorrect orientation will cause circuit failure or component damage.** Unless stated otherwise or obvious, component orientation is not important.

**ATTENTION! TAKE CARE: Follow good safety practices and wear eye protection.**


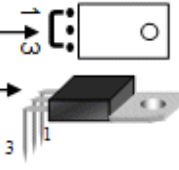



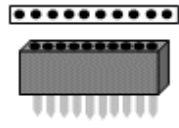
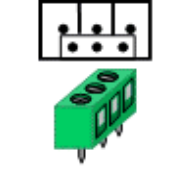
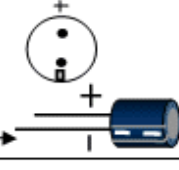
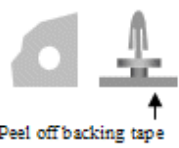
Always wear safety glasses when soldering or clipping component leads.

Avoid contact with hot components while solder components onto the circuit board.

Return the soldering iron back to a well supported protective heat resistant stand.

**TABLE 1. Components assembly order**

Component type	Designator	Value	Comment	PCB symbol & Side view
1 <b>Diodes</b> (Quantity 5)	D1 to D5	1N4007	* <b>CHECK ORIENTATION</b> Bend leads before insertion	
2 <b>Resistors</b> (Quantity 4)	R3, R5 _ R6 _ R7 _	330Ω 1/4W 10kΩ 1/4W 22kΩ 1/4W	Bend leads carefully at 90° Orange, Orange, Black, Black Brown, Black, Black, Red Red, Red, Black, Red	
3 <b>4 pin SIL Socket</b> (Quantity 12)	R0b,R0a,R4a,R4b _ R1b,R1a,R2a,R2b _ R1c,R2c,R3c,R4c _ R1d,R2d,R3d,R4d _ Tr0, Tr1,Tr2,Tr4 _	x2 x2 x2 x2 x4	Take care not to bridge adjacent pins with solder	
4 <b>8 pin DIL Socket</b>	IC1	Picaxe 08 Picaxe08M	* <b>CHECK ORIENTATION</b> Place indent end towards pin 1 on PCB	

Component type	Designator	Value	Comment	PCB symbol & Side view
5	<b>Program Socket</b>	J1	2.5mm Jack	Some sockets need the plastic posts underside removed first 
6	<b>Wire Link or * Voltage Regulator</b>	IC2 Regulator not supplied with the Elementary kit, instead link pin1 & 3	Wire Off-cut or L 7805	For 4.5Vdc battery supply solder a jumper wire pin 1 to 3 For 12Vdc Supply fit the 5V Regulator, use pliers to bend the leads as illustrated 
7	<b>Capacitors</b>	C1, C2 *Optional C3	100nF25V 10nF 25V	0.1uF or 100nF 0.01uF or 10nF 
8	<b>* Switches</b>	SW3, SW4 Not supplied with the Elementary kit	6x6mm 12.5mmH	Momentary Push Switch, insert one side in at a time 
9	<b>* Power Socket</b>	J2 Supplied only on request	2.5mm DC Socket	For Power Pack Supply, an alternative option for T5 
10	<b>10 pin SIL Socket</b>	J3 * Not supplied with the Elementary kit		Take care not to bridge adjacent pins with solder 
11	<b>3 way Screw Terminal blocks</b>	T0, T1, T2, T3, T4, *T5	X6	<b>CHECK ORIENTATION.</b> Place terminals with wire entry holes facing outwards *On application a Power Pack supply option, T5 can be replaced with J2 power socket. 
12	<b>Electrolytic Capacitor</b>	C4	X1	<b>* CHECK ORIENTATION</b> Typically a line on the side of the cap indicates the negative (-) pin. 
13	<b>Adhesive Support Post (Quantity 4)</b>	4mm Corner holes	x4	Insert Post underside of the PCB one in each corner. Remove backing tape and fix onto a solid mounting plate.  Peel off backing tape

**\* Note: Not all components listed here are supplied in the Fundamental kit packet.**

### **POWER SUPPLY OPTIONS**

#### **4.5V Battery operation: (3x AA Battery pack)**

For 5V Regulated Power supplies and 4.5V Battery Packs place a wire jumper to link pins 1 & 3 of IC2, Refer to the dotted line on Figure 2.

Check capacitor C4 pin alignment is correct for (+) and (-) polarity.

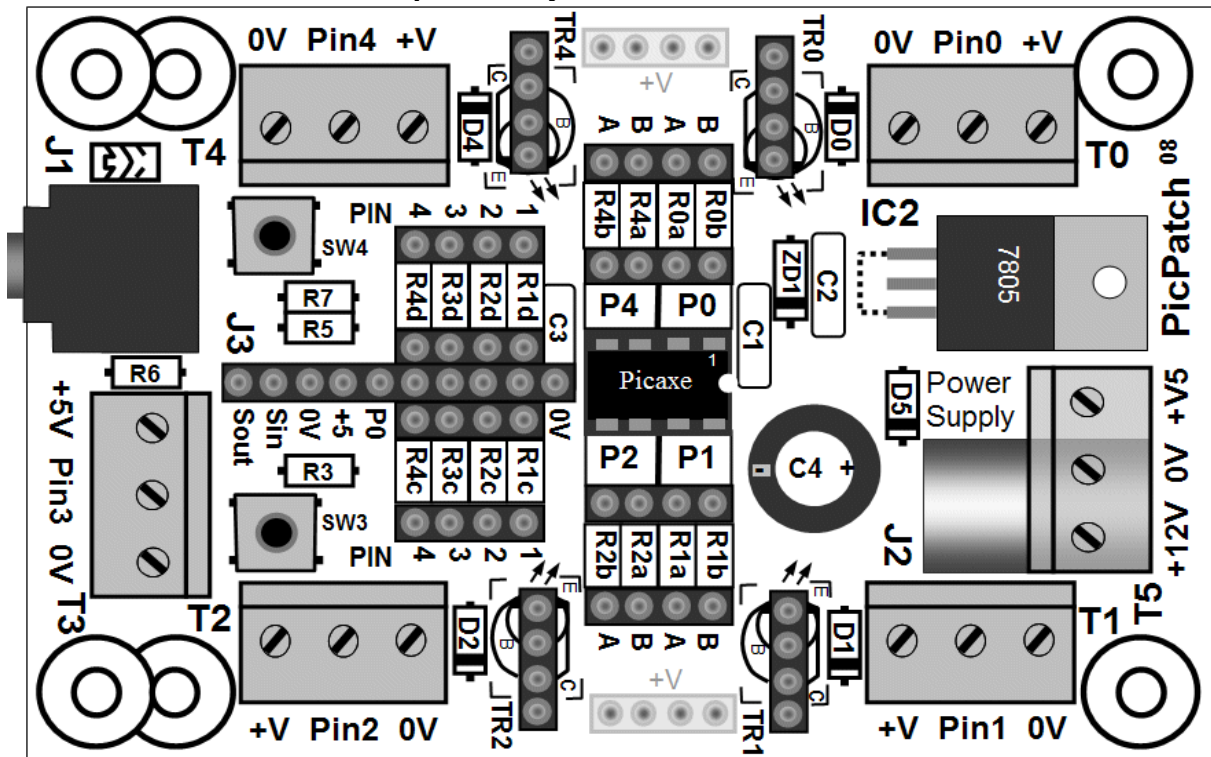
Placing C4 is optional for battery operation but we recommend fitting C4 for all motor and relay applications. For larger transient current loads in excess of 200mA, increase the capacitor value by 100uF for each 100mA increase in loading.

### 12V to 24Vdc Power Pack or Battery operation:

For a supply voltage in excess of 5.5Vdc fit IC2 which is a 5V 7805 series Voltage Regulator. The maximum load is 50mA without a heat sink fitted and 100mA with an adequate heat sink fitted.

If the load current on the +5V rail exceeds 50mA the regulator will get hot and may shut down to protect itself from over heating. If the regulator exceeds 70°C fit an “L” shaped aluminium heatsink between the regulator tab and circuit board to improve heat dissipation. Use a M3 machine screw, spring washer and M3 nut to fix the heatsink and regulator to the circuit board.

**FIGURE 2. PicPatch<sup>08</sup> component layout**



### INSPECTION

After the PicPatch circuit board is completely assembled the first thing to do is to perform a visual inspection of the solder joints and perform a preliminary electrical test. Check all component pins are soldered correctly with adequate solder, no visible dry solder joints and no solder bridges between adjacent pins. After the inspection a preliminary power up test is required to check there is no short circuit on the supply lines.

A 330Ω resistor is initially connected in series with the battery pack red supply wire to limit the current should a short circuit be present. This series resistor is removed after the preliminary power-up test has been completed. For more information refer to last page for details on “**Safe Working Practices and Testing**”.

Utilising the Basic editor program which you can download for free from Revolution Education Website, you will now be able begin to develop your own microcontroller system program.

**WARNING! Do not apply a supply voltage greater than 5 volts to the PicPatch +5V supply rail. Failure to follow this warning will destroy the Pic microprocessor chip IC1 and void the guarantee.**

If your supply voltage is greater than 5 volts you must fit the 5V Voltage Regulator IC2. Connect the supply into T5 +12V terminal and the regulator will ensure the +5V supply rail will not exceed 5 volts.

**TABLE 2. ADDITIONAL MATERIALS REQUIRED**

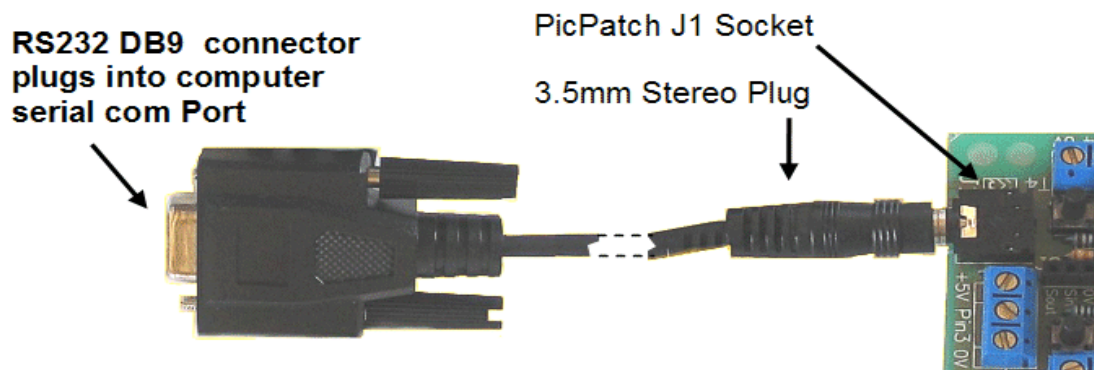
Items	Comment
3x AA Batteries for the Battery Pack	Place Batteries into the Battery pack after completed assembled. The Battery Pack voltage = 4.5Vdc
Damp cleaning sponge, Kitchen pad, heat resistant foam or cardboard	This is used to hold over top of inserted components while the PCB is tipped upside down to hold the components in while soldering the leads.

**TABLE 3. TOOLS REQUIRED**

Tools	Information
Medium tip Soldering iron	2mm Ø tip heated to about 290 to 320°C
Soldering Iron Stand and damp sponge	A small damp sponge is for occasionally cleaning of the iron tip.
De-soldering pump	For removing excess solder or removing components from the PCB.
Small side-cutters	Trimming component leads and stripping wire
Small pointed-nose pliers	Bending component leads and removing wire from the plastic sheath
Small 3mm blade screwdriver	For tightening screw terminals
Safety Glasses	Use during soldering or trimming wires with side cutters.
Digital Multimeter ( 3.5 digits )	For measuring voltage at the supply terminals and resistance.

### TESTING

The next step is to check the microprocessor chip is able to communicate with the PC. Connect the serial cable DB9 connector to the PC com port as per the Picaxe editor instructions and connect the serial cable into the PicPatch connector J1.


**FIGURE 3. Program Cable Connection**


Start the Picaxe Editor program on the PC and type in the following program the **“Debug b1”**.

If you have a *html* copy of this document open on your computer you can copy and paste this routine directly to and from the clipboard into the Editor program.

**‘Program 1 “Debug b1”** - b1 will clock up to 255 then start back at 0

Loop: LET b1 = b1 + 1	‘increment value of b1
DEBUG b1	‘send to the PC debug window the value of b1
PAUSE 500	‘wait 0.5 seconds
GOTO Loop	‘go back to the “Loop” routine to repeat the exercise

Switch on the power switch on the Battery Pack and press the RUN button  on the screen to download program 1 into the Picaxe microcontroller. There will appear a line of blue segments indicating the program is downloading into the microcontroller chip.

The Debug window in the Editor program should display “Debug B1” followed by an incrementing value. This test will be sufficient to check the PicPatch circuit board is assembled correctly and communication with the PC. See figure 5.

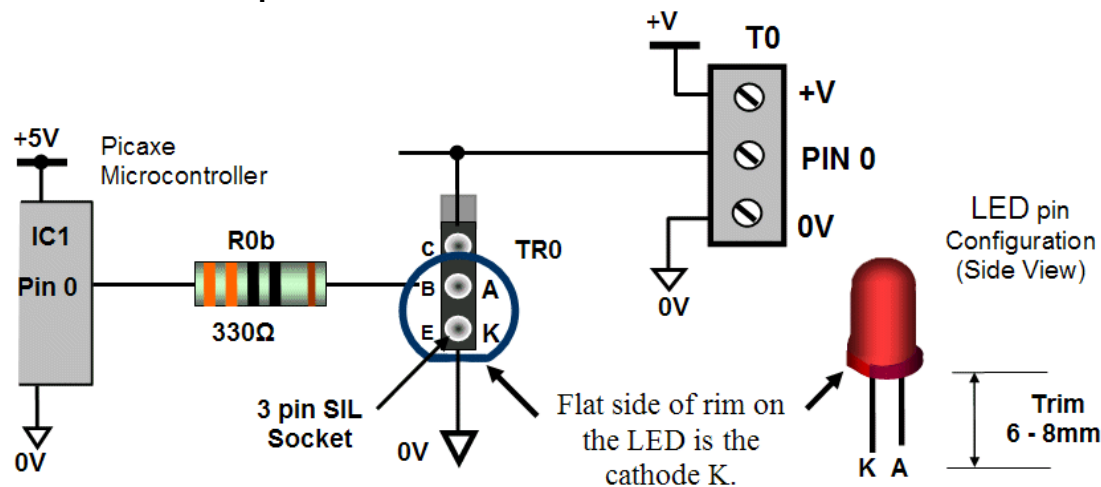
If an error report appears on the screen or there is no reply from the micro, check the cable is connected correctly to J1 on the PicPatch circuit board. Check the DB9 connector is connected correctly into the computer socket and that the components on the circuit board are fitted correctly with no short circuits between adjacent pins or dry solder joints.

After the preliminary test has been completed and the Picaxe Microcontroller operates successfully the 330Ω resistor in series with the red supply wire can be removed. Reconnect the red supply wire directly to the appropriate supply terminal.

To get an LED to flash connect a 330 ohm resistor into the R0b position and an LED in the TR0 SIL socket with the cathode K lead inserted into the SIL socket E pin position and the anode lead A inserted into the B pin position, see Figures 1, 2 and 4.

The Led will flash when data is being transmitted from the Microcontroller to the PC.

**FIGURE 4. LED placement illustration**

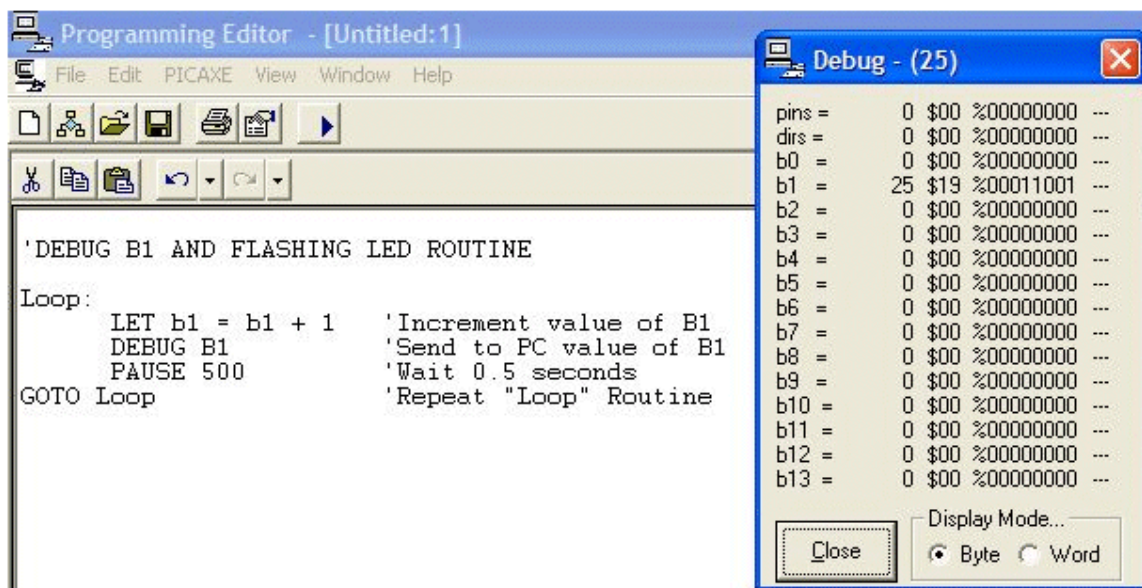


The next step is to read the article in the Editor program “Getting started”, which explains and illustrates some basic information and routines you can try out on the PicPatch.

Under the “Quick Start” title you will find a flashing LED routine which you can modify the port pin numbers to test each port pin. You will need to move the 330Ω resistor and LED to the different port circuit positions, Rb1,TR1, Rb2,TR2 and Rb4,TR4.

Once you have done this step and checked the input operation of Port Pin3 the next step is to decide on a basic project to start on and build.

Figure 5. View of Picaxe Editor Program and Debug Window



### Computer Requirements

Computer (Windows™ operating system) with RS232 DB9 serial com port.  
If your computer only has a USB port you will need to use a suitable USB to RS232 serial interface module which you can purchase from an electronics retail outlet.

Download and install the Revolution Education Picaxe basic Editor program

[www.picaxe.com](http://www.picaxe.com)

### Tips

- Removing wires from inside the external plastic sheath, pull one pair of twisted wires out first using pliers, the remaining wires will be easier to remove. Keep the outer plastic sheath for future projects.
- To strip the insulation off a wire, carefully strip approximately 5mm off at one time using side cutters.

### Technical Support Documentation

- Soldering Techniques and Quality                   A000094
- Safe working practices and testing                A000181
- Component chart and tables                        A000179

For further technical information on project ideas visit website [www.kei.co.nz](http://www.kei.co.nz)

### References

- PicPatch is a trade name of KEI Ltd
- Picaxe is a trade name of Revolution Education
- Pic is a trade name of Microchip Technologies
- WINDOWS is a trade name of Microsoft

## NOTES

**ATTENTION!****Personal Safety Precautions**

We wish to advise our customers that while assembling any Kitset product, follow good safety practices, wear appropriate safety equipment and keep your worksite safe and tidy.

**Electrical Safety Precautions**

Before commencing electrical work which involves voltages in excess of 32Vac or 50Vdc seek advice from your local electrician, qualified service technician or training provider.

KEI prides itself on helping our customers the best way we can with easy access to products, applications ideas, quality information and providing well documented technical support material.

If you have any ideas on how we can improve our services to help you with product detail, product quality or you just simply what to find out more about the our products and services KEI has to offer please contact us by Email or visit our Website.

Contact information:

Email            [info@kei.co.nz](mailto:info@kei.co.nz)  
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